THE TRANSFERENCE OF LEARNED AVOIDANCE RESPONSES FROM A SHOCK-AVOIDANCE SITUATION TO A DIFFICULT DISCRIMINATION-AVOIDANCE SITUATION

By

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CHAPTER I

INTRODUCTION AND REVIEW OF THE LITERATURE

Dollard and Miller (1941) and Child and Waterhouse (1953) have hypothesized that people may learn general habits of responding to all frustrations or anxieties. This is equivalent to saying that stimuli produced by affective states may act as discriminative cues for the conditioning of instrumental responses.

Freud (1936) was perhaps the first investigator to put forth the idea that anxiety could be used as a cue. He concluded that anxiety was an emotional or affective reaction to a danger situation and this anxiety functioned as a 'signal' for the ego to initiate appropriate defensive responses. Miller and Dollard (1941, 1950) take essentially the same attitude in that they propose that the stimuli produced by anxiety reactions may act as a source of drive and may also have cue properties. Their attitude toward the cue producing properties of the state of anxiety is stated in the following quote:

> After the individual has learned to escape from many different painful and anxious situations by stopping and withdrawing, the anxiety stimulus may become a cue for stopping and reversing whatever response is in progress. After this has been learned, any cues arousing anxiety would be expected to tend to elicit stopping and retreating even though the subject had not had a chance to stop and retreat in the original painful situation responsible for connecting the anxiety to those cues (Miller and Dollard, 1941, Chapter 4).

Frustration has also been conceptualized as being an important affective state with drive and cue properties in much the same way as

Miller and Dollard have conceived anxiety. (Brown and Farber, 1951; Adelman and Maatsch, 1955; Amsel and Ward, 1954; Amsel, 1958; Spence, 1960) As Brown and Farber state: ". . .many 'nonemotional' responses can become conditioned to frustration generated, as well as to external stimuli"(Brown and Farber, 1951).

Brown (1961, Chapter 6) expanded his theory of frustration by hypothesizing that the transfer of learned responses from one frustrating situation to another could be mediated by, ". . .internal cues characteristic of the state or condition of frustration."

Spence (1960) and Amsel (1958) have developed similar theories of non-reward generated frustration. Three major points can be seen in Spence's (1960) conceptualization of extinction through frustration:

1. Non-reinforcement of a previously reinforced response results in an 'emotional' state or response, designated (r_f). Spence calls this particular (r_f) an 'anger' response. This (r_f) is seen as contributing to general drive level (D).

2. The strength of (r_f) increases as the strength of the fractional anticipatory goal response (r_g) increases. Both (r_g) and (r_f) are conditioned to stimuli preceding the goal.

3. The frustration response (r_f) produces cues (s_f) that tend to elicit learned or unlearned behavior which may compete with the previously rewarded responses to the situation.

Thus the (r_f-s_f) mechanism results in adding to general drive level (D) and is the source of incompatible responses which are,". . .triggered and motivated uniquely by the frustration that non-reinforcement produces" (Amsel, 1958).

An experiment by Bernstein (1957) has supported the hypothesis that frustration as an affective state has cue properties. Bernstein first trained animals in a wheel-turning avoidance response. In order for the animal to avoid shock he had to rotate the wheel within 3 seconds after the onset of the CS (buzzer). He then extinguished the animal's avoidance response under four conditions of delay of avoidance - 0, 2, 4, and 8 seconds, i.e., the onset of the CS occured 0, 2, 4, and 8 seconds before the wheel was made available to the animal. Greater resistance to extinction was exhibited by the 2 and 4 second delay groups. Bernstein interpreted the results as indicating that the frustration from the delay added to the general aversiveness of the situation thus delaying the extinction process. Bernstein then trained the same animals to run a straight alley maze and extinguished this response under the assumption that the second extinction, ". . .would have stimulus ('frustration') properties in common with the first extinction." His hypothesis was supported as the original 2 and 4 second delay groups took longer to extinguish the maze running habit than the 0 or 8 second delay groups.

According to Yates (1962) the distinction between the antecedent conditions of frustration and anxiety is not sufficient to warrant considering them as two separate intervening variables. He points out that anxiety has been conceptualized as having many of the same properties as frustration. Both frustration and anxiety are hypothesized to have drive and cue properties and escape from both frustration and anxiety constitute a reinforcing state of affairs.

Part of the confusion between anxiety and frustration may lie in the experimental procedures generally used to produce the two emotional states. There are two major experimental paradigms which have been used to investigate anxiety or frustration, the avoidance conditioning paradigm used to investigate anxiety or fear (Mowrer, 1960; Miller,1948a) and the conflict paradigm used to study frustration (Miller, 1944; Brown, 1942).

Mower's (1960) theory of avoidance conditioning suggests that in a noxious situation an emotional response (r_e) is classically conditioned to those stimuli impinging upon the organism. This emotional response, inturn, produces stimuli (s_e) which elicit escape responses. The escape responses are then reinforced by the emotion-relief. Miller (1959) has suggested that when an animal is faced with a difficult discrimination or a situation where two response tendencies are in conflict, the animal will tend to avoid or escape from the situation. This again suggests that both the avoidance conditioning and the conflict are creating a common emotional mechanism.

Anxiety has often been studied by pairing a neutral stimulus with shock or some other noxious stimulus in an avoidance conditioning paradigm (Mowrer, 1960; Miller, 1948a). The emotional behavior which the animal exhibits is then usually termed anxiety.

Frustration studies, on the other hand, (Brown and Farber, 1951) usually train the animal in a specific response and then block this behavior with a noxious stimulus of some kind. The resulting emotional reaction is said to be frustration. However it is possible to conceive how both procedures will cause a similar emotional response generating similar internal and autonomic cues. For example, in a typical avoidance conditioning paradigm the on-going behavior is interrupted or blocked by electric shock or some other noxious stimulus. This appears to fulfill the requirements of a 'frustration' situation as elaborated by Brown and

Farber (1951). In frustration experiments, the animal whose performance of a habit is blocked by an electric shock or some other aversive stimulus may also, as in the avoidance conditioning paradigm, develop anxiety in addition to frustration.

Therefore,frustration as defined by the typical conflict-frustration paradigm and anxiety as defined by the avoidance conditioning paradigm overlap with respect to the external cue complexes generated by the two different procedures. Internally, the cue complex produced by the avoidance conditioning and the cue complex produced by the frustration paradigm also intersect. It is this homogeneity in both the external and internal cue conditions that may mediate the similarity of behaviors in animals exposed to both situations. For example, experimental neurosis has been produced by both conflict and aversive conditioning procedures (Miller, 1944; Pavlov, 1913; Cook, 1939; Smart, 1965). Maher (1966) has suggested that conflict produced by a difficult discrimination is ". . .naturally aversive and threatening. . .," in much the same way as an electric shock.

> When faced with a difficult discrimination, the subject will respond by escaping from the situation. When escape is not possible, the responses may include whatever partial escape responses are possible, but also will include those responses to noxious stimulation, i.e., the pattern of responses usually identified as fear (Maher, 1966, Chapter 6).

Therefore, if the emotional state caused by an aversive stimulus such as shock has cue properties similar to the aversive affective state caused by conflict produced by a difficult discrimination task then an avoidance response previously conditioned to and effective in the reduction of the emotional state caused by shock may also be effective in reducing and avoiding the emotional state caused by conflict induced by a difficult discrimination task.

CHAPTER II

STATEMENT OF PROBLEM

It is the purpose of this study to explore experimentally the possibility that the emotional affective states caused by (1) an avoidance conditioning paradigm using shock as an aversive stimulus, and (2) a conflict condition caused by a difficult discrimination task produce internal cues that may act as mediating mechanisms for the transfer of learned avoidance responses from one situation to the other.

The general hypothesis is that a response used to reduce anxiety in one situation will be used to reduce anxiety, if it occurs, in another situation. However, before stating specific hypotheses, certain assumptions must be made.

1. An avoidance response is conditioned in part to internal physiological and proprioceptive stimuli which precede or accompany the avoidance response.
2. These interoceptive stimuli to which the response to shock has been conditioned are in part the same internal stimuli which accompany frustration through non-reward and conflict.
3. When an animal is faced with a difficult discrimination, any response which terminates the discrimination stimuli will reduce any frustration associated with the discrimination and thus be reinforced.

Out of three groups of rats, Group E was conditioned to bar press to avoid shock and was then given a gradually increasing difficult discrimination. During the discrimination trials a bar was available and would terminate the discrimination stimuli if pressed. Group CI was also given avoidance training but given an easy discrimination. Group CII was given no avoidance training but was given the same gradually increasingly difficult discrimination as Group E.

Hypotheses

If the difficult discrimination evoked the same internal physiological and proprioceptive stimuli that had previously been conditioned to an avoidance response then:

1. The animals who received avoidance conditioning and a gradually increasing difficult discrimination (E) would have a significantly higher mean number of bar press avoidance responses per discrimination level than the animals with no previous avoidance conditioning (CII).
2. The mean number of bar presses in the avoidance-difficult discrimination group should increase significantly as the discrimination becomes more difficult.
3. The mean number of bar presses in each discrimination session should be significantly higher for the avoidance-difficult discrimination animals in comparison to the avoidance-easy discrimination animals (CI).

CHAPTER III

METHOD

Subjects

The Ss were thirty-two male and five female naive albino rats of the Sprague-Dawley strain. Each animal was forty-four days old at the start of the training. The average weight at the beginning of the training was 141.9 gm.

Apparatus

The present study involves two separate pieces of apparatus. The preliminary apparatus was a LVE automated Skinner Box equipped with a floor grid for electric shock. The second or discrimination apparatus was a straight double alley maze 53 inches long, 8¼ inches wide, 9 inches deep, and painted flat black throughout (See Figures 1 and 2). An opaque guillotine door separated a start box from a choice box and a clear plexiglas guillotine door separated the choice box from the two alleys beginning 6 3/4 inches in front of the plexiglass door. The top of each alley was illuminated by a row of twelve 7 watt bulbs wired in parallel with an Adjust-a-Volt Variac, type 500R, having an input of 120 VAC. The lights were housed in the top of each alley and were spaced two inches apart. There was also a food reward dispenser at the end of each alley through which correct responses were rewarded.

A bar press mechanism was located on the right side of the choice

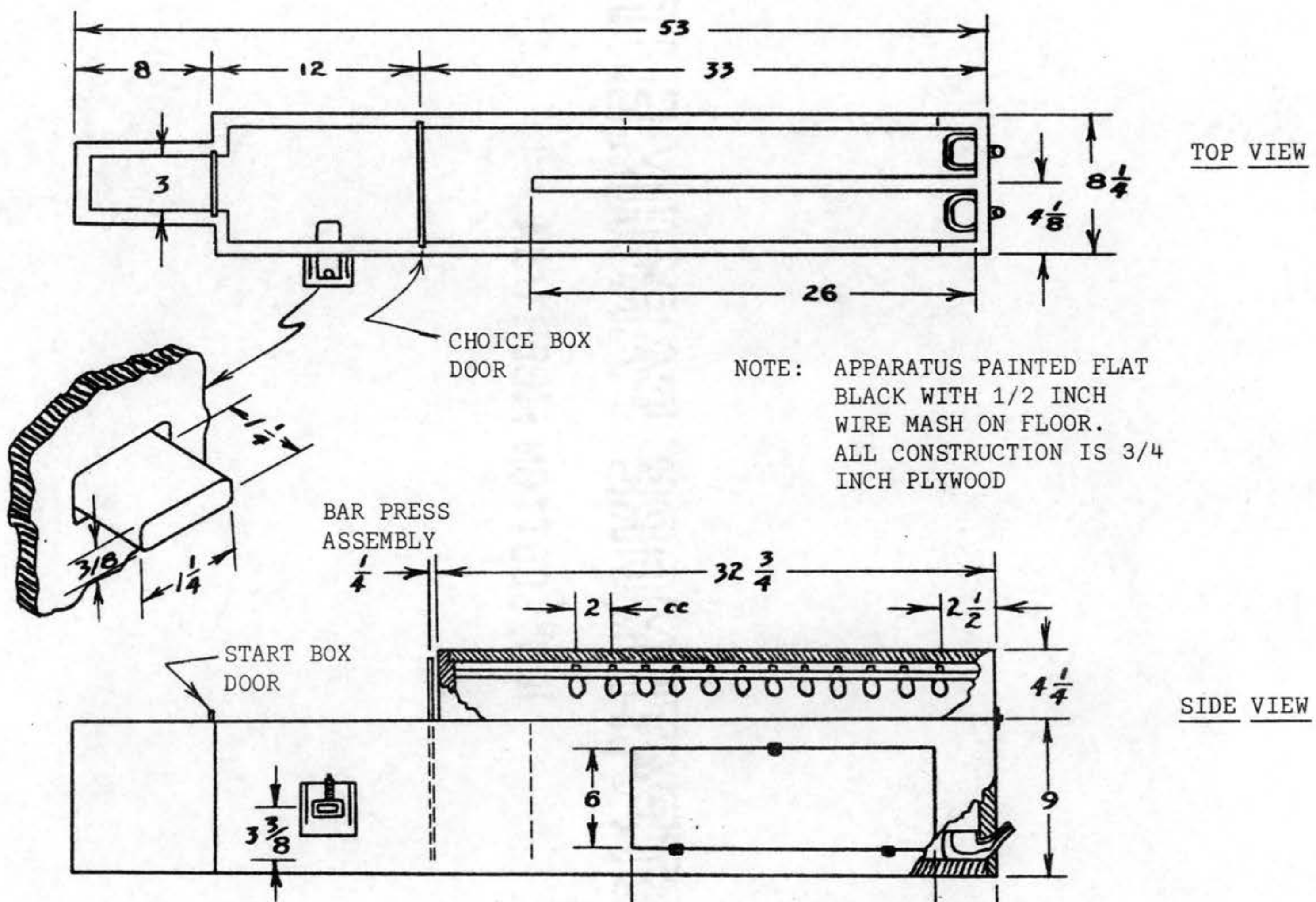

Figure 1. Discrimination Apparatus

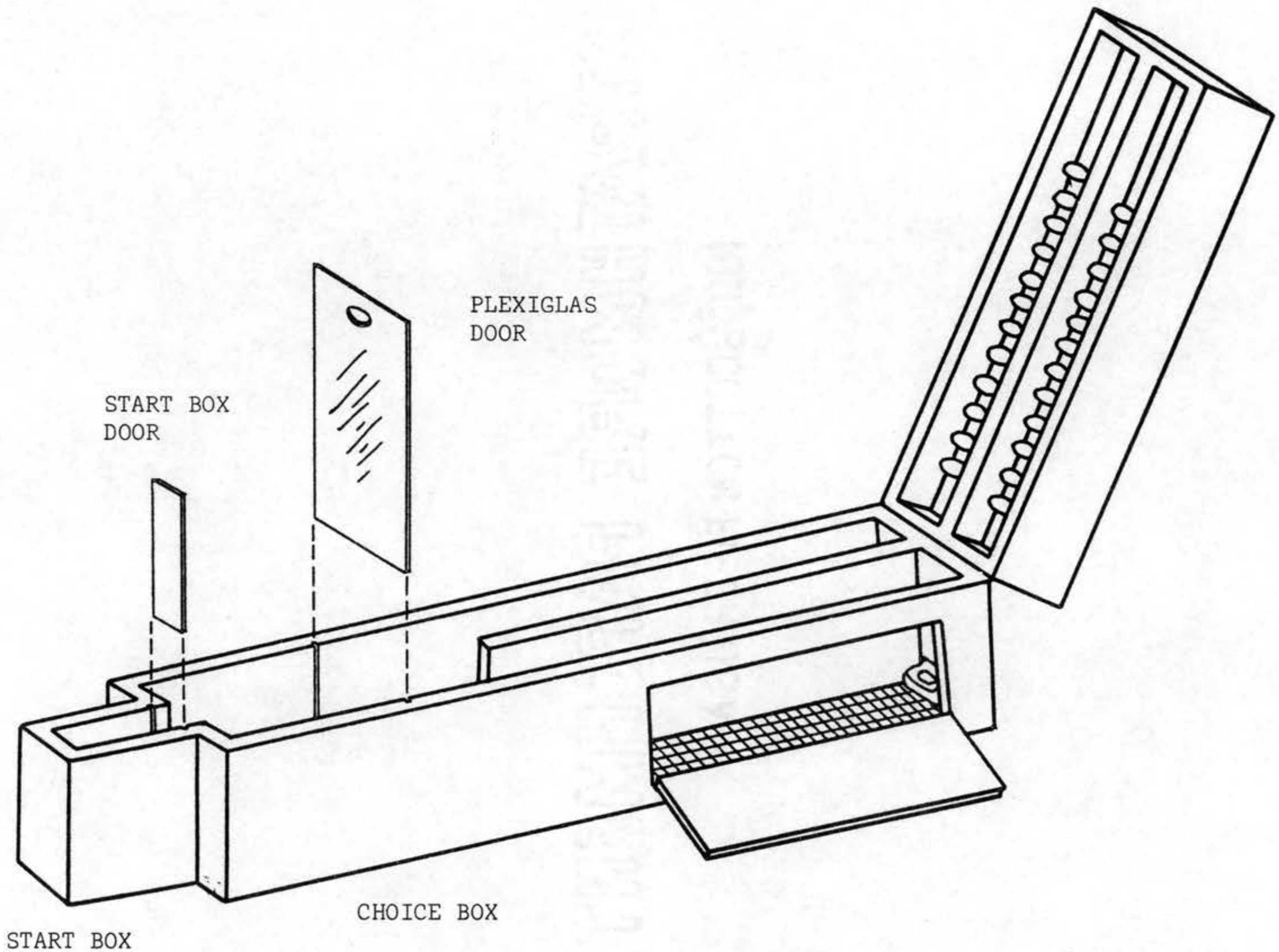

Figure 2. Descrimination Apparatus

box. The press was of standard size, i.e., approximately 3/8" thick, 1 1/4" wide and extended into the choice box approximately one inch.

Upon raising the start box door a microswitch triggered a 30 second timer. The bar press mechanism was connected to the timer and the lights. Therefore, a depression of the bar press resulted in shutting off the lights and stopping the timer at the number of seconds elapsed between the raising of the start box door and the bar depression.

Procedure

Selection of Groups

Thirty-seven albino rats were randomly divided into three groups. Group E, had 12 Ss; the control groups CI and CII had 12 and 13 Ss respectively.

Seven days before training began all animals were placed on a 23 hour food deprivation schedule. This schedule continued until the study was complete. During the experiment all animals were run 23 hours hungry and fed one hour immediately after their performance. Each animal was housed in an individual cage and had access to water at all times. The study was conducted in three stages involving both sets of apparatus.

Stage I

Experimental Group E and control Group CI were given avoidance conditioning training in an automated Skinner Box equipped with electric shock. Before an animal began avoidance training, he was placed in the Skinner Box for ten minutes for adaptation purposes, during which time he was allowed to explore the apparatus. Directly following this adaption period avoidance conditioning training took place. The shock consisted of 24 DC scrambled volts. Each animal received approximately .2MA shock on each trial.

At the start of avoidance conditioning the buzzer was sounded followed five seconds later by a constant electric shock applied to the feet of the animal by an electrified grid. The animal could terminate the buzzer and the shock simultaneously by pressing an available bar press. When the animal failed to terminate the shock with the proper response, the buzzer and shock would automatically cease ten seconds after the shock began. When the animal pressed the bar with a latency of five seconds or less after the onset of the buzzer, he would avoid the shock completely. The animal was never removed from the shock box during each training period and the intertrial interval was thirty seconds. Each training period consisted of twenty-five trials. Criterion was reached when an individual animal successfully avoided the shock on 5 out of his last 10 trials.

Each animal in control Group CII was randomly matched with an animal in the experimental Group E. Therefore, each animal in CII spent the same amount of time in the shock apparatus as his matched E animal. The CII animals received no shock or avoidance conditioning training. The amount of handling was kept constant for all animals.

Stage II

Stage II began 24 hours after each subject in the E and CI groups reached criterion in avoidance conditioning. Thus, after reaching criterion, an E animal and his corresponding match in CII started Stage II on the same day. During this stage all animals were individually adapted to the discrimination apparatus and were given pretraining. During adaptation and pretraining the bar press was present but not operational.

Adaption

In order to accustom the animal to the maze, lights and location of the food pellets each animal was placed in the apparatus for ten minutes. During this period, the animal was allowed to roam freely and eat the food pellets which were available in the goal boxes of each alley. The brightness of both alleys was equal at 90.6 Ft.-C as measured at the start of each alley with a Macbeth illuminometer, #1661069.

Pretraining

A period of pretraining was necessary for the animal to learn to run the maze for reward and get used to the sounds and time delays in the experiment. Pretraining also constituted the learning of the initial brightness discrimination.

Session I. - All Ss received 10 pretraining trials to run and eat in the maze. The brightness of each alley was adjusted so that one alley had a brightness of 90.6 Ft.-C and the other a brightness of 4.5 Ft.-C. During the ten trials the bright alley was on the left five times and on the right five times in random order.

Each animal was placed in the start box for 15 seconds. At the end of this time the start box door was raised and the animal was allowed to progress into the choice box. The discrimination door was then raised and the animal was hand guided down the bright alley where food reward was available in the goal box. The animals remained in the goal box for

10 seconds and were then removed to the start box where the procedure repeated itself.

Session II. - In Session II the animals had preliminary training on the initial discrimination. Preliminary work showed that the animals tended to learn the discrimination faster with corrected trials vs.non-corrected trials and that the 30 second delay between the opening of the start box door and the choice door severely retarded learning. Therefore, each animal was given 100 corrected trials on the 90.6 vs. 4.5 Ft.-C brightness discrimination beginning 24 hours after a particular animal had completed pretraining--Session I. Each animal was placed in the start box for 15 seconds. At the end of this time both the start box door and the choice box door were raised simultaneously. When the animal ran to the correct stimuli (brightest alley) he was allowed to stay in the goal box ten seconds and eat two 45 mg. Noyes Rat Reward Pellets. The animal was then removed and placed in the start box for the second trial. If, however, the rat chose the wrong stimuli to respond to he was allowed to correct his error. Thus, the animal was eventually rewarded on every trial. Training was broken up into sessions consisting of twenty trials each.

Session III. - The purpose of Session III was to introduce the 30 second delay between the start box door and the choice box door. In the preliminary work, the delay had had debilitating effects on performance. Each animal began this session 24 hours after he had completed the 100 previous trials. During this training a thirty second delay was introduced between the opening of the start box door and the choice box door. The rest of the procedure continued to be the same including the relative brightness of the two alleys. Each animal was required to reach a criterion of 8 correct responses out of their last 10 corrected trials before moving on to the last pretraining session.

Session IV. - The purpose of Session IV was to introduce uncorrected trials to prepare the animal for Stage III and to make a final check of the animal's learning of the discrimination. This last pretraining session began 24 hours after each animal had reached criterion in Session III. The procedure in Session IV was the same as in Session III except that now the trials were of an uncorrected nature. Thus, if the animal proceeded down the wrong alley he was removed after a 10 second stay in the goal box. He was rewarded only when he made the correct choice. Again the relative brightness of the alleys was 90.6 and 4.5 Ft.-C. Each animal was required to reach a criterion of 16 correct responses out of his last 20 trials.

Stage III

Discrimination performance began 24 hours after pretraining ended for each animal. Group E, and Group CII, received a gradually increasing difficult discrimination while Group CI, was given an easy discrimination.

Experimental Group E, and Control Group CII

Animals were placed in the start box for 15 seconds. After release from the start box, the animals were retained in the choice box for a period of 30 seconds. During this period the discrimination stimuli were clearly visible to Ss and the Ss had easy access to the bar press which, when pressed, shut off the discrimination stimuli for 10 seconds. After the ten seconds, the rat was removed from the choice box and replaced in the start box. The trial was then recorded as an avoidance trial. When the animal failed to press the bar within the 30 seconds, the transparent plexiglas choice box door was lifted and the animal could run to either alley. If the rat ran to the bright side he would get two reward food pellets. If he ran to the dim side the rat would receive no reward. After the animal had spent 10 seconds in the goal box of either the correct or wrong alley, he was removed from the apparatus by hand and placed back in the start box.

The initial discrimination problem consisted of 90.6 vs. a 4.5 Ft.-C differential in brightness. In successive discriminations the 4.5 Ft.-C value remained constant for all Ss while the brighter choice decreased in three discrete values: 26.7, 12.8, and 7.4 Ft.-C. Animals in Groups E and CII received 20 trials in succession on each discrimination level.

Control Group CI

The same procedure was used with Group CI except that Group CI did not receive the four levels of discrimination. Group CI received 80 trials on discrimination level 90.6 vs. 4.5 Ft.-C in four 20 trial sessions.

CHAPTER IV

RESULTS

The data was analyzed to evaluate the three major hypotheses:

1. There would be a significant difference in the avoidance bar pressing means per discrimination session between animals with previous avoidance conditioning, Group E, and animals without previous avoidance conditioning, Group CII. The animals with previous avoidance conditioning would have a significantly higher mean.
2. As the discrimination level becomes more difficult the mean number of bar press avoidance responses in Group E should increase.
3. The mean number of bar press avoidance responses should be significantly greater when the animals are faced with a difficult discrimination in comparison to when the animals are faced with an easy discrimination even though both groups of animals have had previous avoidance conditioning training.

Appendix A and B give a summary of the avoidance conditioning data and discrimination data for each animal along with samples of the data collecting sheets. Data was collected for twelve animals for each group. One CII animal died during the course of the experiment.

Table I gives the mean number of bar press responses for each group over the four discrimination sessions. Figure 3 shows the mean number

TABLE I

MEAN NUMBER OF BAR PRESS RESPONSES PER DISCRIMINATION SESSION FOR ALL GROUPS

	Discrimination Sessions			
Group	I	II	III	IV
E	.66	.83	1.00	1.33
CI	.25	.58	.42	1.33
CII	.83	.58	1.00	.75

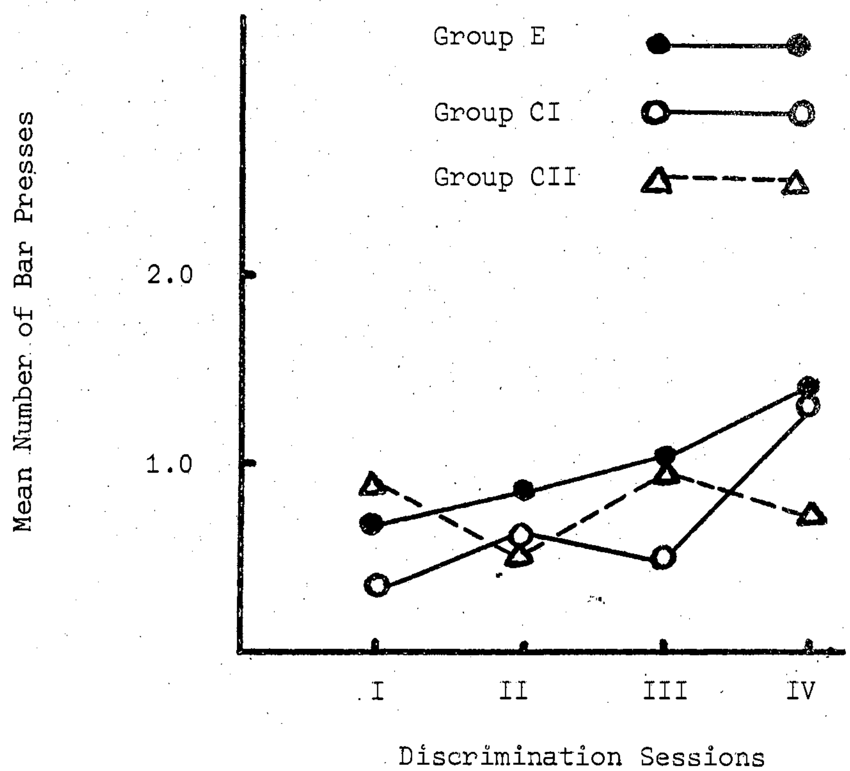

Figure 3. Mean Number of Bar Presses Per Discrimination Sessions for All Groups.

TABLE II

TWO WAY ANALYSIS OF VARIANCE ON GROUPS E AND CII

SOURCE	SS	df	MS	F
(A) Avoidance Training	.6666	1	.6666	.5153<1
(B) Discrimination Sessions	2.0833	3	.6944	.5368<1
Interaction Between A and B	1.9167	3	.6389	.4939<1
Error	113.8334	88	1.2935	
Total	118.5000			

of bar press responses plotted as a function of discrimination session for all three groups. A two way analysis of variance (Hays, 1963) was performed on Groups E and CII and the hypothesis of no difference between groups could not be rejected at the .05 confidence level. There were also no significant differences in bar press rate between discrimination sessions and there was no significant interaction between avoidance conditioning and level of discrimination. All F values were less than one (see Table II).

A Duncan's test (Steel and Torrie, 1960) was performed on the means of bar press responses for Groups E and CI in each discrimination session and no significant differences were found between the mean number of bar press responses.

Although bar press responses did not significantly increase for Groups E and CII as the discrimination level became more difficult, a qualitative change in the animal's behavior became noticable. The animal's level of activity, e.g., random movements, circling and exploring increased while the animal was confined in the choice box. The behavioral change was not noted in Group CI. However, this observation was informal and no objective activity measure was taken.

CHAPTER V

DISCUSSION

The hypothesis of higher mean avoidance responses per discrimination level by the animals exposed to previous avoidance conditioning was rejected. There was no significant differences in the bar press rates per discrimination level between animals exposed to previous avoidance conditioning and animals that were not exposed. Thus the avoidance training had little effect on subsequent bar pressing avoidance behavior.

The hypothesis of an increase in avoidance behavior as the discrimination became more difficult was also rejected. It appears that discrimination difficulty had little to do with bar pressing behavior. The lack of interaction between avoidance training and discrimination level indicates that the animals exposed to avoidance training were no better equipped to avoid a difficult discrimination by a bar press response than were the unexposed animals.

The third hypothesis of a greater mean number of bar press avoidance responses by animals faced with a difficult discrimination in comparison to animals faced with an easy discrimination was rejected. There were no differences between the means per discrimination session of animals previously exposed to avoidance conditioning and faced with a difficult discrimination and animals faced with an easy discrimination.

It may be concluded that there was no transfer of response from the shock-avoidance situation to the difficult discrimination-avoidance situation. This failure of transfer may be viewed according to several alternative hypotheses:

1. Animals respond to external and internal cues if they are specific.

In most of the learning studies the cues attended to are fairly specific. For example, in avoidance conditioning the external stimulus is usually a light, buzzer, or noise as a CS. Studies in drive level have dealt with specific drives such as the hunger, thirst, or sex drive. All of these studies deal with relatively specific internal or external events. Both anxiety and frustration reactions involve varied physiological and emotional systems each of which may not function in the same way each time the animal is said to be in a state of anxiety or frustration. Thus, the state of anxiety or frustration may be so variable in quality as to negate any one specific response to every quality of the state. Whereas the avoidance conditioning is anxiety arousing or frustrating (Mowrer, 1960), as indeed is the difficult discrimination (Miller, 1959; Maher, 1966), they may arouse in the animal two qualities of this state to which there is little if any stimulus overlap.

If it is assumed that both situations did elicit the same quality of emotional response the quantity of these responses could have had an effect on the avoidance behavior.

2. The difficult discrimination did not elicit emotional cues of sufficient strength to warrant avoidance behavior.

Although the discrimination was arranged to produce the greatest amount of conflict, i.e., the difficult discrimination approached the stimulus which resembled the original negative stimulus (Miller, 1959; Brown, 1942b), the stimulation may not have been sufficient to warrant avoidance. Brown (1942b) has shown that in a non-reward procedure rats failed to show effects of an increasing difficult discrimination. He reasoned that an approach-avoidance conflict was necessary for the conflict to induce escape behavior. His non-reward for a wrong choice was not sufficiently aversive to build up a steep avoidance gradient. The animals did not have a strong enough aversiveness to the discrimination to warrant leaving the field or performing escape behavior. Instead, the animals, when exposed to a difficult discrimination, would treat the situation as a mild approach-approach conflict and make indiscriminate approaches.

3. The instrumental avoidance response was conditioned to the buzzer (CS) alone.

Since the buzzer (CS) was a major part of the animal's immediate environment during the avoidance conditioning, it is possible that the avoidance response was dependent more on the external stimulus (CS) than on internal cues. Due to the latency in the autonomic emotional responses and their corresponding stimuli, an avoidance response could occur after the buzzer (CS) but before the internal autonomic stimuli (S_e). The proprioceptive stimuli would have little stimulus consequences in the discrimination apparatus since they were conditioned during avoidance training directly to the buzzer.

If the buzzer could have been eliminated from the stimulus complex during avoidance conditioning the animal would have to rely on internal cues for the avoidance behavior. One suggested way to accomplish this elimination of the buzzer would be to place the animal in the Skinner box and after a given segment of time after the onset of shock, sufficient for all autonomic responses to take place, expose the animal to a response. After a number of trials, the animal would respond to being placed in the Skinner box with a fear or anxiety reaction which in turn produces its characteristic stimuli. However since an avoidance response can not occur immediately due to the forced delay between placing the animal in the Skinner box and allowing an avoidance response to take place, the autonomic stimuli can take place and have a greater probability of being conditioned to the avoidance response. Thus, the avoidance response would depend almost entirely on internal cues. This would, in turn, increase the internal stimulus similarity between the avoidance conditioning situation and the discriminative-avoidance situation and facilitate any transference of avoidance behavior.

4. The intervening training between avoidance conditioning and the difficult discrimination inhibited the mediating effects of the internal stimuli.

The fourth alternative hypothesis is probably the most parsimonious explanation of the apparent lack of transfer. The time period between each animal completing avoidance conditioning training and starting the discrimination sessions varied according to his rate of learning the initial discrimination and reaching the various criterions. During this period many stimuli which were originally conditioned to the avoidance response could have been extinguished. One important external cue, the bar press, was present during the pretraining. During this period any anxiety that was conditioned to the bar press during avoidance training could have been extinguished. A possible way to minimize this intervening time would have been to train the animals to criterion on the initial discrimination, train them in an avoidance response with shock and then confront the animals with a gradually increasing difficult discrimination. This procedure would eliminate an "extinction" hypothesis and equalize the intervening time period between the two aversive situations for all animals.

Another aspect of the present study which warrants a closer inspection is the observation of increased activity in the choice box for Groups E and CII as the discrimination became more difficult.

As Amsel (1948) and Spence (1960) have pointed out, the non-reinforcement of a previously reinforced response produces frustration and its specific cues (s_f). These cues tend to produce an increase in drive level and along with this random activity. In the present study the number of incorrect responses increased as the discrimination level became more difficult (See Figure 5). Thus, frustration became more intense as the discrimination grew more difficult. This frustration would lead according to Amsel's (1948) theory to increased activity. Although by subjective observation, this hypothesis was supported.

A possible measure of activity would be the number of bar press responses per discrimination level. However, in the present study the bar press was not a major component of the environment being relatively small in comparison to the total area of the choice box. Thus, it was not a major measure of random activity. Tighe and Leaton (1967) found that bar press rates did significantly increase when a group of rats previously exposed to an easy discrimination was suddenly given a difficult discrimination. The apparatus used was of the same type as the discrimination box of the present study, however, the bar press was 2" x 4". Thus, the bar press became a direct measure of the activity in

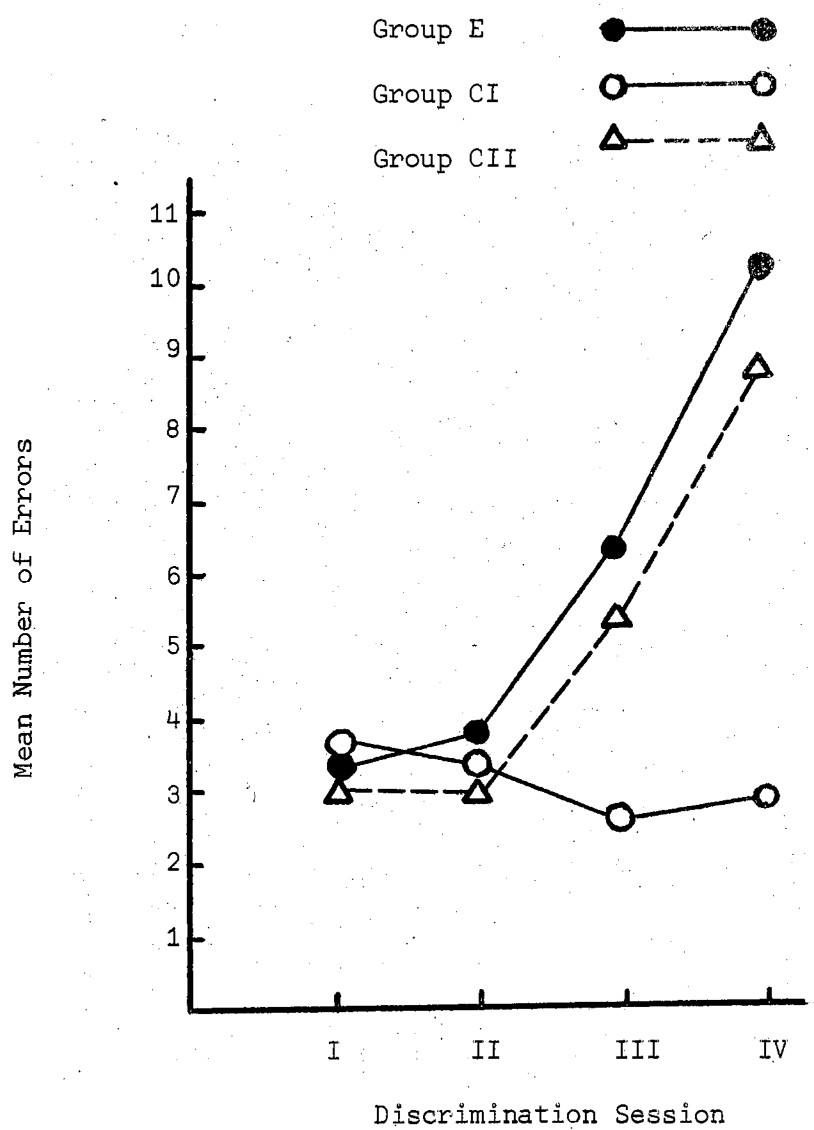

Figure 5. Mean Number of Errors as a Function of Discrimination Session for All Groups.

that random movements could easily result in a bar press. Although Tighe and Leaton overlooked this explanation, this activity could explain findings in both the present study and theirs. The activity drive generated by the frustration could produce responses which could compete with a learned avoidance response. The increase of bar pressing in the Tighe and Leaton study could have been due to the increase in activity drive as measured by their bar press and the failure of bar pressing responses in the present study could be due to the unsuccessful competition between the avoidance response and the random responses produced by the increase in activity drive. However, this is a question for further study.

This study required the animal to transfer a response almost entirely by internal cues, the bar press being the only similar external cue in both the avoidance conditioning and the discrimination sessions. A logical extension of this study would be to bring the external cues closer together in graded steps to see what part internal emotional cues play in such a transfer if any.

Another possible and interesting extension of the present study would be to move up the phylogentic scale to higher level organisms. The conditioning of specific responses to relatively diffuse anxiety states may be a capacity of only higher organisms with a greater capacity for symbolic behavior. In short the white rat may not be capable of the transference of responses by way of emotional or autonomic cues.

CHAPTER VI

SUMMARY

Many theorists (Brown, 1961; Dollard & Miller, 1941; Child and Waterhouse, 1953) have hypothesized that organisms may respond to all frustrations and anxieties in a similar way. To investigate this hypothesis two different emotion arousing situations were presented to three groups of albino rats, E, CI, CII. Each group contained 12 subjects. Groups E and CI first learned an avoidance response (bar pressing) to shock applied through an electrified floor grid. Group CII was given no avoidance training. All groups were then given training on an easy brightness discrimination during which an error trial resulted in non-reward. As soon as each animal reached criterion on the initial discrimination animals in Groups E and CII were given performance trials on four levels of discriminations that increased in difficulty. Group CI received performance trials of the same number as Groups E and CII but on the same initial discrimination. During performance trials the animals had access to a bar press located at the choice point which when depressed, shut off the discrimination.

There were no progressive changes in bar pressing rate in Groups E and CII. Pervious training in the avoidance response did not seem to effect the bar pressing rates in the avoidance of the difficult discriminations. However, Groups E and CII did show increased activity as the discrimination became more difficult.

This finding agrees with Amsel's and Spence's theory that frustration through non-reward produces an increase in general drive level (D) and activity. Moreover, this activity drive could have produced responses which could have had an inhibiting effect on the specific avoidance response, i.e., bar pressing.

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APPENDIX A

TABLE III

PERFORMANCE OF EACH INDIVIDUAL ANIMAL PER DISCRIMINATION SESSION GROUP E

Rat No.	No. Trials Correct				No. Error Trials				No. Bar Presses				Avg. Bar Press Lat. (seconds)			
	Discrimination Sessions															
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
E-1	20	18	16	10	0	1	4	10	0	1	0	0	----	21.8	----	----
E-2	17	15	17	8	3	3	2	10	0	2	1	2	----	23.2	17.1	8.7
E-3	12	11	12	12	4	9	5	8	4	0	3	0	16.6	----	27.6	----
E-4	16	14	15	7	4	5	5	9	0	1	0	4	----	24.5	----	20.5
E-5	12	11	11	11	7	9	9	9	1	0	0	0	16.2	----	----	----
E-6	18	17	8	7	0	2	9	12	2	1	3	1	20.7	17.9	24.2	13.8
E-7	18	18	9	8	2	2	11	12	0	0	0	0	----	----	----	----
E-8	19	15	14	6	1	2	5	11	0	3	1	3	----	19.4	22.9	13.2
E-9	17	16	13	12	3	4	7	8	0	0	0	0	----	----	----	----
E-10	15	18	16	9	5	2	3	9	0	0	1	2	----	----	24.7	7.6
E-11	13	14	10	9	7	5	9	11	0	1	1	0	----	26.8	14.3	----
E-12	16	16	13	7	3	3	5	12	1	1	2	1	28.6	28.9	10.7	7.8

TABLE IV

PERFORMANCE OF EACH INDIVIDUAL ANIMAL PER
DISCRIMINATION SESSION GROUP CI

Rat No.	No. Trials Correct				No. Error Trials				No. Bar Presses				Mean Bar Press Lat. (seconds)			
	Discrimination Sessions															
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
CI-1	18	15	17	15	1	5	3	4	1	0	0	1	18.4	----	----	23.3
CI-2	17	17	20	14	3	2	0	4	0	1	0	2	----	16.2	----	21.7
CI-3	18	10	19	17	2	10	1	3	0	0	0	0	----	----	----	----
CI-4	20	19	19	20	0	0	0	0	0	1	1	0	----	15.6	17.8	----
CI-5	19	17	19	17	1	1	0	3	0	2	1	0	----	15.6	10.8	----
CI-6	18	20	18	17	2	0	1	0	0	0	1	3	----	----	13.9	15.3
CI-7	14	14	14	10	6	6	5	8	0	0	1	2	----	----	28.8	21.3
CI-8	16	18	13	16	4	2	7	3	0	0	0	1	----	----	----	15.9
CI-9	16	20	19	19	3	0	0	0	1	0	1	1	25.7	----	7.3	4.2
CI-10	14	17	14	19	6	3	6	1	0	0	0	0	----	----	----	----
CI-11	12	14	15	16	8	5	5	1	0	1	0	3	----	14.6	----	22.6
CI-12	15	14	15	10	4	6	5	7	1	0	0	3	29.9	----	----	13.5

TABLE V

PERFORMANCE OF EACH INDIVIDUAL ANIMAL PER DISCRIMINATION SESSION GROUP CII

Rat No.	No. Trials Correct				No. Error Trials				No. Bar Presses				Mean Bar Press Lat. (seconds)			
	Discrimination Sessions															
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
CII-1	20	20	11	9	0	0	7	9	0	0	2	2	----	----	17.9	17.6
CII-2	13	18	15	9	4	1	3	10	3	1	2	1	10.7	27.6	8.8	21.6
CII-3	11	12	8	9	9	7	9	8	0	1	3	3	----	15.2	18.3	22.4
CII-4	16	15	12	14	0	2	7	6	4	3	1	0	8.9	5.1	12.3	----
CII-5	19	19	15	16	0	1	4	4	1	0	1	0	19.3	----	29.0	----
CII-6	19	20	14	13	1	0	5	7	0	0	1	0	----	----	9.1	----
CII-7	15	15	14	11	5	4	6	8	0	1	0	1	----	20.7	----	10.9
CII-8	13	14	17	8	7	6	3	12	0	0	0	0	----	----	----	----
CII-9	16	17	16	10	3	3	3	8	1	0	1	2	17.9	----	10.2	24.2
CII-10	15	18	17	7	4	2	3	12	1	0	0	0	8.2	----	----	----
CII-11	19	14	13	12	1	5	7	8	0	1	0	0	----	21.6	----	----
CII-12	16	14	14	6	4	6	5	14	0	0	1	0	----	----	21.9	----

TABLE VI

SUMMARY OF AVOIDANCE AND DISCRIMINATION CRITERION DATA

Rat No.	Trials to Avoidance Criterion	Session 2 Last ten Trials-No. Correct	Session 3 Trials to Criterion	Session 4 Trials to Criterion
E-1	84	7	11	20
E-2	162	9	17	18
E-3	236	7	43	19
E-4	147	9	18	39
E-5	219	9	10	33
E-6	74	8	11	37
E-7	224	9	22	18
E-8	254	8	43	25
E-9	195	6	10	19
E-10	177	6	11	20
E-11	168	7	10	92
E-12	259	7	39	25
CI-1	210	8	36	21
CI-2	201	7	10	100
CI-3	176	9	54	20
CI-4	42	8	9	17
CI-5	40	9	29	46
CI-6	179	9	22	71
CI-7	72	8	50	30
CI-8	232	7	32	59
CI-9	139	8	36	19
CI-10	232	9	45	17
CI-11	167	6	19	25
CI-12	204	7	10	46
CII-1		8	9	16
CII-2		10	8	17
CII-3		6	10	30
CII-4		10	10	33
CII-5		10	25	20
CII-6		9	8	32
CII-7		8	13	20
CII-8		7	59	22
CII-9		7	31	74
CII-10		9	19	42
CII-11		6	10	91
CII-12		10	20	40

APPENDIX B

DATA COLLECTION SHEET FOR
AVOIDANCE CONDITIONING

DATE: __________ LAST FEEDING TIME: ______ TODAY'S FEEDING TIME: ______

RAT NO: ________

TRIAL NO.	NO RESPONSE	ESCAPE	AVOID	COMMENTS
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				

COLLECTION SHEET FOR DISCRIMINATION DATA

DATE: ________________

RAT NO. ______________ DISCRIMINATION SESSION: _____

TRIAL NO.	CHOICE		BAR PRESS	LATENCY	COMMENTS
	CORRECT	ERROR			
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

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